utilizes a plurality of precision thin-film piezoelectric elements to detect rotation, such as pitch, roll, and yaw, while rejecting spurious noise created by vibration, thermal gradients, and electro-magnetic interference. During a normal operation, selected piezoelectric elements on the gyro are driven by a periodic signal to create a controlled mechanical oscillation. When the gyro is subjected to rotational motion, such as pitch, roll, or yaw, a characteristic electrical signal is produced across other piezoelectric elements on the gyro, according to the Coriolis Effect. These electrical signals are amplified and filtered to extract high-fidelity signals proportional to the rate of rotation.

2 Ond.

On page 17, the first full paragraph is replaced as follows:

The first sensor module 122 includes a plurality of rotational rate sensors or micro gyros 136. One of the sensors 136 is for a directional gyro 132, and the other one is for an attitude gyro 130 (see Figure 3). A driver 134, e.g. an oscillator, provides oscillation signals to the rotational rate sensors 136 and receives feedback from a filter 160. The rotational rate sensors 136 provide rotational rates for pitch, roll, and yaw angles of an aircraft. The output electrical signals of the rotational rate sensors 136 are proportional to the rate of rotation in the pitch, roll, and yaw directions.

13

On page 17, the second full paragraph is replaced as follows:

The second sensor module 124 includes a plurality of compensation sensors. One of the compensation sensors is a temperature sensor 140. Another compensation sensor is a DC accelerometer 142 for measuring acceleration, vibration, or gravitational force. A third compensation sensor is a magnetometer 144 for measuring the magnitude and direction of a magnetic field. The compensation sensors provide acceleration, magnetic field, and temperature compensation signals. The output electrical signals of the compensation sensors are proportional to low-frequency linear (i.e. DC) acceleration, temperature, and magnetic heading. It is appreciated that the compensation sensors, such as magnetometer 144, may be placed outside of the housing of the system 100. For example, an out-board magnetometer may be placed at the

4 Ont.

24 rear end of an aircraft. Similarly, it is appreciated that in Figures 2 and 3, other components of the system 100 may be placed outside of the housing of the system 100.

On page 18, the first full paragraph is replaced as follows:

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5 An analog-digital converter (ADC) 138 converts the output electrical signals from the gyro sensors 136 and compensation sensors 140, 142, 144 into digital signals and sends the information to a microcontroller 126 for data processing.

On page 26, the first full paragraph is replaced as follows:

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16 In addition, an identical mirror-image pair is located on opposite side of the proof-mass 168 (i.e. X1/X2 and X3/X4). During operation, these quad pairs (2X2) generate electrical signals associated with motion along a particular coordinate axis. The differential nature and symmetric placement along the coordinate axes allows motion in other directions to be rejected, thereby increasing the signal accuracy. The amount of "off-axis rejection" is largely contributed by the symmetry of the pairs, matching of the elements, and precision placement. Such arrangement reduces the systematic drift and random noise normally present in a rotational rate sensor, thereby dramatically improving the performance of the system 100.

IN THE CLAIMS

Claim 36 is canceled without prejudice or disclaimer; claims 2, 16, 20-22, and 37-40 are amended; and new claims 41-44 are added as follows:

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2. A gyroscopic navigation system, comprising: